picture encoding system by Moving Picture Coding Experts Group), to a bit stream composed of variable length data, and to a decoding apparatus of the same, and more particularly relates to an encoding apparatus and a decoding apparatus for carrying out encoding and decoding at a high speed by parallel processing and methods of the same.

Please replace the paragraph starting on page 26, line 20, with the following paragraph:

Note that the variable length coding can be divided into the phase for generating the variable length data from the fixed length data by table conversion and the phase for combining the variable length data to generate the bit stream. These two phases may be sequentially executed, or only the latter phase may be sequentially executed and the former phase be executed in parallel. Note that a buffer memory becomes necessary between the former phase and the latter phase in the latter method.

In the Claims:

Please substitute the following claims for the pending claims with the same number:

1. (Amended) An encoding apparatus for encoding a data stream comprising a plurality of data blocks the encoding apparatus comprising a multiprocessor system comprising:

a plurality of signal processing devices connected by a signal transfer means on which said data blocks are transferred, each signal processing device comprising:

an fixed length encoding means for carrying out a fixed length coding of selected data blocks to produce encoded data blocks; and

a variable length coding means for carrying out a variable length coding of said encoded data blocks and outputting variable length coded data blocks via said signal transfer means; and wherein

said plurality of signal processing devices includes a master processor and a slave processor for executing in parallel the fixed length coding and the variable length coding.

2. (Amended) An encoding apparatus as set forth in claim 1, wherein each of said variable length coding means of said plurality of signal processing devices detects completion of the variable length coding of a current data block and starts variable length coding of a subsequent data block.

3. (Amended) An encoding apparatus as set forth in claim 2, wherein:

said data stream comprises image data,

each of said fixed length encoding means of said plurality of signal processing devices carries out said fixed length encoding for each image slice data block comprising an image slice, and

each of said variable length coding means of said plurality of signal processing devices carries out variable length coding on each image slice data block.

4. (Amended) An encoding apparatus as set forth in claim 3, wherein

each of said fixed length encoding means of said plurality of signal processing devices comprises;

a motion compensation predicting means for selectively carrying out motion compensation prediction by referring to a reference image,

a transform means for carrying out a predetermined transform with respect to pixel data of a result of said motion compensation prediction or with respect to original pixel data to provide transformed block data,

a quantizing means for quantizing the transformed block data to provide quantized block data, and

a local decoding means for decoding the transformed block data to generate the reference image to be supplied to said motion compensation predicting means, and wherein

each of said variable length coding means of said plurality of signal processing devices carries out variable length coding on the quantized block data.

5. (Amended) An encoding apparatus as set forth in claim 4, wherein said data blocks are macroblocks.

6. (Amended) An encoding apparatus as set forth in claim 4, wherein the predetermined transform is any of a discrete cosine transform (DCT), a Fourier transform, a Hadamard transform, and a K-L transform.

7. (Amended) An encoding method for encoding a data stream, the method comprising:

dividing said data stream into a plurality of data blocks;

successively allotting said data blocks to individually assigned signal processing devices in a plurality of signal processing devices;

encoding said data blocks in parallel in each of said individually assigned signal processing devices to produce encoded data blocks;

successively carrying out variable length coding on the encoded data blocks in its individually assigned signal processing device; and

successively allotting additional data blocks to the signal processing devices that have completed variable length coding.

8. (Amended) An encoding method as set forth in claim 7, wherein each of said plurality of signal processing devices detects when variable length coding for a current data block has been completed and begins variable length coding of a subsequent data block.

A3 cont'd

9. (Amended) An encoding method as set forth in claim 8, wherein

said data stream comprises image data,

and further comprising the steps of, in each of said plurality of signal processing devices,

performing motion compensation prediction for said data blocks by referring to a reference image to generate compensated data blocks;

performing a predetermined transformation on the compensated data blocks to generate transformed data blocks;

quantizing the transformed data blocks to generate quantized data blocks; and

obtaining the reference image from at least one of the quantized data blocks.

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10. (Amended) A decoding apparatus for decoding a data stream comprising a plurality of data blocks including fixed and variable length coded data blocks, the decoding apparatus comprising:

a multiprocessor system comprising a plurality of signal processing devices, each of the signal processing devices comprising:

a variable length decoding means for successively carrying out variable length decoding on variable length coded data blocks to obtain fixed length encoded data blocks; and

A3 cont'd

a fixed length decoding means for fixed length decoding said fixed length encoded data blocks, wherein

said plurality of signal processing devices includes a master processor and a slave processor for executing in parallel the fixed length decoding and the variable length decoding.

11. (Amended) A decoding apparatus as set forth in claim 10, wherein each of said variable length decoding means of said plurality of signal processing devices detects completion of the variable length coding of a current data block and starts variable length coding of a subsequent data block.

12. (Amended) A decoding apparatus as set forth in claim 11, further comprising an allotting means for sequentially allotting the variable length coded data blocks to said plurality of signal processing devices, and

wherein each of the signal processing devices performs both the variable length decoding and the fixed length decoding of a data block allotted to it.

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13. (Amended) A decoding apparatus as set forth in claim 11, wherein

said data stream is a variable length coded image data stream obtained by fixed length and variable length encoding of image data blocks and wherein each of the signal processing devices performs both the variable length decoding and the fixed length decoding of a data block allotted to it.

14. (Amended) A decoding apparatus as set forth in claim 13, wherein

each of decoding means of said plurality of signal processing devices comprises

A3 cont'd

an inverse quantizing means for inverse quantizing variable length decoded data blocks to obtain inverse quantized data blocks,

an inverse transform means for carrying out an inverse transform on said inverse quantized data blocks to obtain inverse transformed data blocks,

an image data generating means for generating original image data by referring to a reference image, and

a motion compensation processing means for carrying out motion compensation processing based on at least one of the inverse transformed data blocks and said image data blocks to generate said reference image.

15. (Amended) A decoding apparatus as set forth in claim 14, wherein said image data blocks are macroblocks.

16. (Amended) A decoding apparatus as set forth in claim 14, wherein said inverse transform is one of a discrete cosine transform (DCT), Fourier transform, Hadamard transform, and K-L transform.

17. (Amended) A decoding method for decoding a data stream comprising a plurality of data blocks including fixed and variable length coded data blocks, the method comprising:

successively allotting variable length coded data blocks to a plurality of signal processing devices;

in each signal processing device, carrying out both variable length decoding on an assigned data block followed by fixed length decoding of said assigned data block,

wherein the signal processing devices perform the variable length decoding and fixed length decoding of assigned data blocks in parallel.

18. (Amended) A decoding method as set forth in claim 17, wherein each of said plurality of signal processing devices detects when variable length decoding for a current data block has been completed and begins variable length decoding of a subsequent data block.

19. (Amended) A decoding method as set forth in claim 18, wherein

said data stream comprises a plurality of image data blocks,

and further comprising the steps of, in each of said plurality of signal processing devices,